Knowledge to Practice:

aci Foundation

ACI Foundation Welcomes New Trustees

It is with great pleasure that we announce the addition of two new trustees: Robert J. Frosch and William E. Rushing. They join Michael J. Schneider, current Chair of the Board of Trustees, who begins his second 3-year term, and six other serving trustees: Joseph M. Bracci, Ronald G. Burg, Jeffrey W. Coleman, Cary S. Kopczynski, Antonio Nanni, and Michael J. Paul. The ACI Foundation is honored to have these two outstanding individuals as the newest ACI Foundation trustees.

Frosch is a Professor of Civil Engineering and Senior Associate Dean of Facilities & Operations in the College of Engineering at Purdue University, West Lafayette, IN. An ACI Fellow, he is a past member of the ACI Board of Direction and past Chair of the ACI Financial Advisory Committee (FAC). As Chair of FAC, he led the selection of a new investment advisor for the Institute as well as the development of a new investment policy and a new spending policy. He is currently Editor-in-Chief of the *ACI Structural Journal*, Chair of the ACI Committee on Codes and Standards Advocacy and Outreach, and Chair of ACI Subcommittee 318-D, Members. He is also a member of the ACI Technical Activities Committee (TAC) and ACI Committee 318, Structural Concrete Building Code. His research, which focuses on the design and behavior of structural concrete, has resulted in changes in engineering practice and changes to the building codes for both buildings and bridges. He received his BSE from Tulane University, New Orleans, LA, and his MSE and PhD from the University of Texas at Austin, Austin, TX. He is a licensed professional engineer in Indiana and Louisiana.

Frosch is the recipient of numerous awards, including the 2002 ACI Young Member Award for Professional Achievement, 2014 ACI Foundation Concrete Research Council Arthur J. Boase Award, Precast/Prestressed Concrete Institute (PCI) Young Educator Achievement Award, and the University of Texas at Austin Outstanding Young Alumnus Award. He was recently named a Fellow by the American Council on Education.

Rushing is a Vice President and Manager of the Civil and Environmental Engineering Department at Waldemar S. Nelson & Co., Inc., New Orleans, LA. He is an ACI Past President, a past ACI Board of Direction member, and past Chair of the ACI Financial Advisory Committee. Rushing chaired the Strategic Plan Initiative for ACI (2012-2014) just before his service as ACI President.

An ACI Fellow, Rushing serves on several ACI committees, including the ACI Chapter Activities Committee and 314, Simplified Design of Concrete Buildings; 351, Foundations for Equipment and Machinery; and 376, Concrete Structures for Refrigerated Liquefied Gas Containment.

Frosch

Rushing

Rushing is the recipient of several awards, including the 2004 Louisiana Chapter – ACI Activity Award, the 2010 Chapter Distinguished Member Award, the 2011 ACI Henry L. Kennedy Award, and the 2018 ACI Education Award. Outside of ACI, Rushing is a former Chairman of the State Referee Committee of the Board of Louisiana Soccer Association. Rushing received his BS in civil engineering from Louisiana State University, Baton Rouge, LA, in 1981. He is a licensed professional engineer in Louisiana, Mississippi, Alabama, Arkansas, Georgia, Texas, New Mexico, and Arizona.

Learn more at **www.acifoundation.org**.

ACI Foundation Funds 2019 Concrete Research

We are excited to share that the ACI Foundation funded six research projects this year. In this edition, we highlight two of those projects, while others will be covered in upcoming issues. Our Concrete Research Council provided an in-depth review of 40 submitted proposals and recommended six projects for funding based on impact to industry, ACI committee engagement, and collaboration with other funders and organizations. We are pleased to collaborate financially and technically in progressive research programs.

An Innovative Approach to Concrete Confinement Reinforcement

Principal Investigator Ashley Thrall, University of Notre Dame

Co-Principal Investigator Yahya Kurama, University of Notre Dame

Industry encourages this exciting innovation for concrete confinement in seismic regions. The combination of the high strength and high ductility of steel coil products available in the United States offers several untapped possibilities in construction. This research will investigate one: a knowledge gap in lateral confinement behavior in columns with strip reinforcement. The aim of this research is to study the behavior of seismic precast columns with ductile, high-strength (yield strength of 100 ksi [690 MPa] or greater) steel coiled (spooled) strips as internally placed (embedded)

continuous transverse spiral confinement reinforcement. This work is an extension of current work, funded by PCI, on the effectiveness of strip confinement reinforcement for axial loading. The ACI Foundation-funded research will further develop this innovation through a large-scale experimental investigation of columns under reversed cyclic lateral loads combined with sustained axial loading.

The measured experimental data on the behavior of precast columns under this combined loading will be used to validate confinement models and lead to design recommendations. Understanding this behavior is critical to the accelerated application of this new confinement system in building and bridge structures subjected to seismic loading. While the research will focus on confined concrete columns, results will also be relevant to boundary regions and plastic hinge zones of beams, walls, and piers.

This innovative approach should reduce congestion and speed up fabrication. As compared to reinforcing bar hoop confinement, spiral strips have the potential to provide increased ductility and strength of concrete structures under seismic loading because wider and thinner strips in spiral configuration result in greater volume of effectively confined concrete (strips act like an internal jacket rather than individual reinforcing bar); smaller thickness of strips results in a greater effective depth for the extreme longitudinal reinforcing bar; and greater width and spiral configuration of strips provide better lateral support against buckling of longitudinal reinforcing bars after cover spalling. Steel coiled strips can accelerate fabrication of precast components because strips can be rapidly uncoiled, bent/wrapped, and tied to longitudinal reinforcing bars with no need for splices; and strips with smaller bend radii reduce congestion, thereby easing placement of longitudinal reinforcing bars and concrete.

The focus of the research project is on precast concrete building components and is supported by Joint ACI-ASCE Committee 550, Precast Concrete Structures, but it is also envisioned that the results could potentially apply to bridge structures (piers) in seismic regions or other types of reinforcement with broad use in both the building and bridge industries.

Embodied Carbon in Construction Calculator (EC3) Tool

Principal Investigator Kathrina Simonen, Carbon Leadership Forum—University of Washington
Co-Principal Investigator Phil Northcott, C-Change Labs

The concrete industry has been a great leader in developing environmental product declarations (EPDs), helping designers and engineers calculate and reduce the amount of carbon embodied in the built environment. It is important to continue to promote the accessibility of concrete environmental data. Even though concrete EPDs are increasingly available, it is not easy to compare EPDs side by side, nor is it easy for users to find EPDs for mixtures available in their specific market. The proposed Embodied Carbon Construction Calculator (EC3) tool is designed to address this issue, not just for concrete but for other materials as well. EC3 is a software tool that aims to provide open-source data and intuitive visualizations to help designers integrate embodied carbon into design and procurement decisions. The tool will be cloud-hosted, free, and web accessible.

The goal of the EC3 tool is to be the most available, transparent, and robustly actionable embodied carbon database for construction in North America. Further, the tool aims to include performance standards as a design criterion, and this will help direct the industry to pursue performance-based design standards. With consistent application of assumptions across each project, it can drive improved practice, materials innovation, and vendor accountability for embodied carbon. The EC3 project will be hosted by the Carbon Leadership Forum at the University of Washington, Seattle, WA.

Upon completion, the EC3 tool will showcase the concrete industry's impressive work in calculating and publishing its large body of EPDs. ACI technical input and endorsement is through ACI Committee 130, Sustainability of Concrete. Sean Monkman, Vice President of Technology Development at CarbonCure Technologies and Chair of ACI Committee 130, states, "Sustainable construction decisions hinge upon having accurate and actionable information. Our committee recognizes that there exists a favorable sustainability narrative concerning concrete provided it is discussed and presented fairly." Our co-funding, along with that provided by others—both inside and outside the concrete industry—will help give our industry the opportunity to accurately reflect these aspects of concrete performance.

For more information on the ACI Foundation and research, visit **www.acifoundation.org/research**.